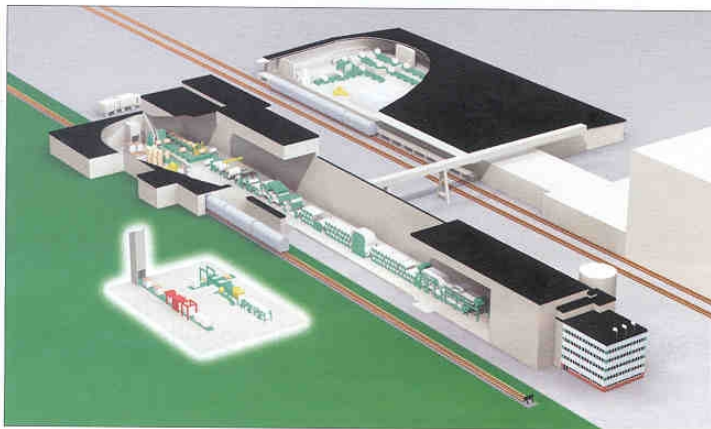


Äänekoski installs ABB drives in BM1 rebuild

M-real, the Finnish paper and board maker, last year rebuilt the Äänekoski BM1 board machine in a remarkably short period of eight weeks from start-to finish. The rebuilt machine re-started on 16 September 2002 having had, amongst other things, 29 of the drives replaced with gearless ABB motors. PMD visited mill manager *Mika Joukio* at the mill in June.



THE DIAGRAM SHOWS THE SECTIONS INVOLVED IN THE BM1 REBUILD.

M-real has 29 production units in nine countries. The company has a sales network covering more than 70 countries the world over and representing over 300 products. The group also includes a wholesale organization - Map Merchant Group - that is the third largest in Europe. M-real's research activities are centralised within four technology centres located in Kirkniemi and Äänekoski, Finland, Örn-sköldsvik in Sweden and Bergisch Gladbach in Germany.

The greatest challenge, in this Äänekoski mill project, designated KART 160, was the time limit set at eight weeks, for dismantling the existing machine, installation of the new equipment and commissioning the revised line. The total investment amounted to about €100 million split between Äänekoski (€70 million) and Kyröskoski (€30 million).

Although designated a rebuild the work entailed an almost total dismantling of the machine and the introduction of a great deal of new equipment. The three original Fourdrinier forming sections, supplied by Valmet, were retained but the majority of the rebuild was carried out by Voith Paper, from Germany. The main engineer for the project was Jaakko Pöyry's, JP Engineering Ltd., based in Tampere, supported by its Äänekoski office.

The aim of the rebuild was to raise capacity by 30% to about 160,000 tpy and to allow for a change in grades from wallpaper base to heavier - 170-335 g/m² - cartonboard destined for the health

care packaging sector. The machine has a working width of 3700 mm. The wallpaper base paper production has been moved to m-real's Kyröskoski mill.

The new grades produced at Äänekoski designated Carta Solida and Carta Integra have a multi-ply structure with BCTMP and machine broke as the centre ply. The centre-ply was previously made up of stone groundwood pulp. The new grades combine the high bright surface of solid bleached board with the stiffness of folding boxboard. The stone groundwood facility at the company's Äänekoski mill was closed down and replaced with fibre from the BCTMP line located in Joutseno. The top and bottom layers are formed out of mixed softwood and hardwood virgin pulp from Metsä-Botnia's chemical pulp mill also located in Äänekoski.

On BM1 the whole of the machine from the couch roll through the press section, the dryers and the pope reel was dismantled and the machine hall floor opened up to the basement to allow for a lengthening of the dryer section.

One of the major tasks of the project engineers was the installation of a new Yankee cylinder, which was cast by Sandusky in the UK. This cylinder is 6.7 m in diameter and to accommodate it the roof of the machine hall had to be opened up for a full four weeks during which there was only one day of rain.

The press section was completely rebuilt from a conventional hard nip to a single hard nip followed by a shoe press. In the dryer section 25 new cylinders were added so that there is a total of 85 cylinders in the present configuration. There are now four pre-dryer groups before the Yankee cylinder and two more groups prior to the size press. Following the new size press is a further dryer group followed by the on-machine coater with three coater stations.

An unusual aspect was the change in the drive system from the conventional line drive system. ABB supplied permanent magnet direct-drive motors along the length of the machine. These motors were connected to the machine through direct shaft drives removing the need for gearboxes. In some cases these shafts had to be slightly offset with universal couplings in order to avoid concrete pillars that form part of the existing machine hall structure. This is the first time such a solution has been used on a board machine.

Mika Joukio said 'When building or rebuilding a board machine we always want to take advantage

of technical innovations. In the first few months since completing the rebuild we have easily exceeded the projected start-up curves.' Within two weeks of the re-start production had reached the gross target capacity. Full rated capacity takes a little longer to achieve as efficiencies are optimised. It normally takes up to 12 months to reach net rated capacities.

This system cuts down on space and the removal of gearboxes reduces maintenance, cooling and lubrication requirements and thus running costs.

Innovative thinking is typical of the m-real Corporation, and not just in technology. The direct drive system is based on permanent magnet motors, frequency converters and software applications. The changeover from conventional asynchronous motors to permanent magnet motor technology is of the same magnitude as the changeover from DC to AC technology a decade ago. The direct drive system includes 29 permanent magnet motor drives and 72 induction motor drives. The permanent magnet motors are controlled through ACS 600 frequency converters. The software application secures the function of the paper machine and safety of the drive system.

The permanent magnet motor is a synchronous motor, where rotor slip is eliminated, providing greater accuracy than asynchronous motors. In an asynchronous motor the slip varies according to speed and load. With a synchronous motor it is simpler to optimise the speed, while the elimination of slip compensation improves dynamic motor control.

The permanent magnets are made from neodymium iron boron, the newest magnetic material on the market. It is the most powerful magnetic material available, with high values of flux density at very high levels of magnetisation.

Mr Joukio said that another big advantage of the direct drive technology was the saving in space. The elimination of the need for gearboxes resulted in the freeing up of space on the drive side of BM1, where space was already very restricted. Simpler configurations also bring an improved level of machine availability.

In the stock preparation system the old refiners were replaced with new ones. As part of this area of the project Metso Paper supplied a new Hydrapulper back in 2001 having started up while the old machine was still running. During the rebuild Metso also supplied the new machine pulpers.

Jymet Engineering supplied the broke conveyors and Core Link delivered a broke roll slitter. The new



THE WIND-UP END OF BM1.



THE DRIVE SIDE OF BM1 SHOWING THE NEW ABB MOTORS.

lubrication system for the whole machine is a centralised system from Safematic.

Metso also supplied four coater circulation systems supplying coating colour to the size press and the three coating heads.

The rebuild of BM1 was preceded by the installation of a completely new pulping unit designed by JP Engineering. This work included a number of improvements in the stock preparation system with the replacement of the old refiners with new ones.

JP Engineering supplied services such as engineering management, time scheduling, and complete engineering of building construction, mechanical piping, electrical and process control engineering. The company also supplied assistance in supervising, erection commissioning and start-up.

On the on-machine coater infra-red driers were supplied by IRT-Solaronics. Pre-calendering takes place in a hard nip calender between the second after dryer section and the coating machine and final calendering is carried out in the soft nip calender between the coater and the pope reel.

After the pope reel, the winder was rebuilt by Metso Paper and the sheet cutter was rebuilt by Pasaban. Honeywell supplied the automation and quality control system, while process electrification was provided by Tekmanni.

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